

# GENERAL SPECIFICATIONS FOR MACHINERY

Bureau of Ships, Navy Department

## SUBSECTION SI-1. PLANS

1 November 1940

(Superseding Subsection SI-1, Plans, dated September 1, 1938)

NOTE:- Plans for the machinery, electrical equipment, and accessories of vessels building for the Navy are always of a confidential nature. Care shall be observed that they do not fall into the hands of unauthorized persons, especially those not citizens of the United States.

The following is quoted from an act approved June 15, 1917:

" \* \* \* whoever, lawfully or unlawfully, having possession of, access to, control over, or being intrusted with any document, writing, code book, signal book, sketch, photograph, photographic negative, blueprint, plan, map, model, instrument, appliance, or note relating to the national defense, willfully communicates or transmits or attempts to communicate or transmit the same to any person not entitled to receive it, or willfully retains the same and fails to deliver it on demand to the officer or employee of the United States entitled to receive it; or whoever, being intrusted with or having lawful possession or control of any document, writing, code book, signal book, sketch, photograph, photographic negative, blueprint, plan, map, model, note, or information, relating to the national defense, through gross negligence permits the same to be removed from its proper place of custody or delivered to anyone in violation of his trust, or to be lost, stolen, abstracted, or destroyed, shall be punishable by a fine of not more than \$10,000, or by imprisonment for not more than 2 years, or both. \* \* \* "

### SI-1-a. General requirements.

- References:
- (a) Navy Department Specification 42B9 - Boxes, spare part, electrical and mechanical (shipboard use).
  - (b) Federal Specification CCC-C-531, Tracing Cloth.
  - (c) List of Bureau standard plans, see Appendix I.

1. All drawings of machinery and accessories under the cognizance of the Bureau of Ships, which shall be furnished by and at the expense of the contractor, are grouped under the following general classification:

- (a) Type A drawings - Preliminary drawings, submitted with bids or prior to award of contract.
- (b) Type B drawings - Development or working drawings, submitted for approval subsequent to award of contract but prior to ordering material or commencing work.

- (c) Type C drawings - Drawings prepared during the progress of work to accompany orders on sub-contractors, particularly orders for steel castings and forgings.
- (d) Type D drawings - Finished drawings, submitted after work is completed.
- (e) In addition to the foregoing, instruction books and pamphlets, plans, and data incorporated in Booklet Plans of Machinery and Record of Electrical Installation shall be supplied as herein-after described.

2. The Bureau's approval of any type of plan shall not relieve a contractor of any material or performance obligation under the contract, unless a question in regard thereto has been brought to the Bureau's attention in writing, and specific waiver of such requirement by the Bureau has been obtained, see section A1. All discrepancies discovered in drawings, in specifications, or between drawings and specifications, shall be immediately referred to the Bureau for action.

3. Drawings need not necessarily be made to scale, but, where practicable, scaled drawings are preferred. When drawings are not made to scale, such facts shall be clearly stated in the drawing title. In all cases figured dimensions of all parts shall be complete and shall include manufacturing tolerances, working fits, and surface finish, wherever applicable. All dimensions shall be given in feet, inches, and decimals or fractions of inches. Dimensions which apply to fitted parts shall be given in inches and fractions of inches with tolerances in decimal fractions; dimensions of non-fitted parts may be given in inches and decimal or common fractions; dimensions greater than 24 inches may be given in feet, inches, and fractions thereof. Where drawings are made to scale one of the following standard scales shall be used.

- 1/16-inch to the foot.
- 1/8-inch to the foot.
- 1/4-inch to the foot.
- 3/8-inch to the foot.
- 1/2-inch to the foot.
- 3/4-inch to the foot.
- 1-inch to the foot.
- 1-1/2-inches to the foot.
- 3-inches to the foot.
- 6-inches to the foot.
- Full size.

4. The following plans shall be drawn to scales as indicated, but larger scales are preferred when their employment will not unduly increase the dimension of the sheet:

- (a) General layout plans of machinery installations of not less than one-quarter inch to the foot.
- (b) Piping layout plans for machinery spaces not less than three-eighths inch to the foot.
- (c) Electrical wiring layout plans for the entire vessel shall be made with decks and other structural features drawn to a scale of not less than one-quarter inch to the foot.

5. All dimensions shall be so placed on drawings that they may be read either from the bottom of the sheet or from the right-hand side.

6. Salient features of the design and performance characteristics of all apparatus shall be prominently shown on every drawing where applicable. Such features shall include:-

- (a) Power input.- Pounds of steam per hour, kilowatts per hour, pounds of oil per hour, etc.
- (b) Power output (normal rated and overload).- Horsepower, kilowatts, gallons per minute, etc.
- (c) Pressure.- Steam, exhaust, suction, discharge, test, bearing, voltage, etc.
- (d) Speed.- Revolution or double strokes per minute, feet per second, bearing or journal surface speed, etc.
- (e) Velocity (steam, liquid, air, gas).- Through pipes and orifices, peripheral, etc.
- (f) Temperature (inlet and outlet).- Steam, superheat, liquids, etc.
- (g) Surfaces (area of).- Heating, cooling, grate, etc.
- (h) Viscosities of liquids handled with corresponding temperatures.
- (i) Power losses.- In same units as (a) and (b).
- (j) Heat transfer.- Coefficient or rate.
- (k) Piping.- Friction head on suction at rated flow, pressure drop through.
- (l) Boilers.- Furnace volume, clear area through gas passages, uptakes, armor bars, gratings, etc.
- (m) Blowers.- Clear area through ducts, intake gratings, armor bars, etc.
- (n) Weights.- As a whole or per unit, computed or actual, wet and dry.
- (o) Power characteristics.- Voltage, frequencies, number of phases, type of windings, starting torque, full-load speed torque, percentage of slip, speed adjustment, duty classification, etc.
- (p) Characteristic curves.- Steam consumption, horsepower, head, pressure, capacities, speed, efficiencies, etc.

7. Where parts of machinery are indicated as being right-hand or left-hand, a note shall be added to the drawing explaining in detail the difference between the right-hand and left-hand parts. Drawings of screw propellers, in addition to diameter, pitch, developed and projected areas of blades, etc., shall show indicated or shaft horsepower, effective horsepower, revolutions, and speed of vessel for which the propeller has been designed. Drawings of valves and miscellaneous fittings shall show the number, material, and location of each type and size. All drawings of apparatus using tubes, such as boilers, condensers, superheaters, feed-water heaters, etc., shall include a table showing number, ordering length, diameter, thickness, material, etc., of each type and size of tube required; the same applies to special brick in boiler combustion spaces. All apparatus using electric cable or wire shall include a table giving length, size, and type of all cable used.

8. Indicating the materials of construction by distinctive crosshatching is not required on any class of drawing; simple line hatching of complete sections or borders of separate parts shall be used wherever necessary to indicate a junction of two different pieces or otherwise to completely clarify the drawing. When distinctive crosshatching is used it shall conform to Bureau of Ships standard B-20.

9. The materials of construction shall be indicated on a list of material in all cases whether distinctive crosshatching is used or not, and this list shall appear in the upper right-hand corner of a drawing sheet, expanding to the left, and down as necessary. Since, under the provisions of Subsection Sl-2, the list of material becomes the medium of agreement between the Bureau and the contractor as to the materials to be employed in construction, it is very important that extreme care be exercised in proper preparation. In order to facilitate Bureau action the following arrangement shall be followed (see also Table I):

- Column 1 - The piece number. (in numerical sequence, 1, 2, 3, etc.)
- Column 2 - The name of piece.
- Column 3 - The number required.
- Column 4 - The material.
- Column 5 - The specification.

10. In the specification column the Navy Department specification and Supplementary General Specifications for Machinery number and class applicable shall always appear for each item considered by the manufacturer to fall in the stressed or otherwise vital class, and so subject to full inspection. Suffix letters, such as the "a" in 43B11a and SGS(41)-37a are not required to identify the particular issue of Navy Department specifications and Supplementary General Specifications for Machinery. The identifying number only, "43B11" or "SGS(41)-37" is necessary. In cases where the manufacturer proposes a substitution, reference to a footnote shall be entered after the Navy Department specification or Supplementary General Specification for Machinery number, and in the footnote the substitution shall be described in sufficient detail as to analyses, tests, heat treatments, etc., as will permit

the Bureau to take proper action without further correspondence and in such form that proper inspection can be made. No entry shall be made in column 5 either of specification number or other designation, where the material is nonstressed or nonessential in character. The Bureau, in acting on the plan, will either accept or return this list of material for revision, and having been agreed upon, and approved, the specification column with its footnotes shall serve as the inspecting officer's guide as to whether a full or only a surface inspection shall be applied, see Subsection SI-2. Additional columns will be permitted in the list of material to suit the special requirements of a contractor, but there shall be no omissions from the information called for. Table I is a typical list of material for drawings and should be followed in carrying out the foregoing instructions. The width of columns and spacing of lines may be increased over that shown to suit requirements.

11. In order to reduce the number of plans for certain classes of material, such as electrical equipment, switchboards, searchlights, and similar apparatus which are made up of parts and subassemblies that are identical except for minor details or in numbers of parts, additional columns may be inserted to the left of column 1. The number required of the items in column 2 (name of piece) shall be tabulated in these additional columns instead of in column 3. This procedure is ordinarily applicable to plans which have been approved previously for similar apparatus on other vessels and may be used for assembly drawings, sub-assemblies, or detail parts. Essentially each item in column 2 is identified by means of the additional columns. If an item in column 2 does not apply to the latest design, the space opposite that item in the additional column shall be left blank. If a part is changed, a new item shall be added to column 2 and the number required of the new item shall be indicated in the additional column. If the number required of any items is changed the new number required will appear in the additional column. Each additional column shall show all the items that go to make up the complete unit corresponding to that column. These items may be sub-assemblies or individual parts, depending on the character of the unit. Plans must be complete, permit ready identification of any part, show all details required for duplication of parts and include all parts which go to make up the complete assembly. An explanatory note shall be added to each plan embodying this procedure that will show clearly which additional columns apply to the particular assembly, sub-assembly, or detail part on the plan, and the complete unit shall be identified by name-plate serial numbers or other positive means.

12. Surface finish shall be indicated for all parts. Where practicable, Bureau standard symbols and method of indicating them shall be used as described below: where the shop practice of a given manufacturer requires symbols differing from the Bureau's standard, the manufacturer's symbols will be acceptable.

#### Finish Surface Marks

f 1. Rough tool finish.	f 4. Polish.	f 7. File.
f 2. Fine tool finish.	f 5. Drill.	f 8. Scrape.
f 3. Grind.	f 6. Ream.	f 9. Spot face.

13. Each piece will be marked with the character of finish required by inserting the corresponding number in the circle, the arrow being placed against the surface to which the finish mark applies. See figure 1.

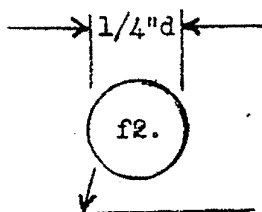


Figure 1

14. The right-hand side of types B and D drawings shall be reserved for titles, list of material, explanatory notes, etc., and type B and D drawings shall conform to the Bureau's standard title block plan No. 385691 for arrangement.

15. The titles of all drawings shall be complete, and for all drawings, except type A, shall be preceded by the official designation of all vessels to which the drawing applies, as obtained from the special specifications therefor or from the Bureau; viz, BB45, DD240, etc. As soon as the vessels are named, the name of each vessel shall be added to its official designation wherever it appears. Names and designations of vessels shall be placed on drawings in letters not less than one-fourth inch high.

16. Each type D assembly drawing of a set for a given item of apparatus or equipment shall carry a drawing list or index showing all other drawings of the set with identification numbers for ready reference.

17. Where welding is to be used, types A, B, and D drawings shall show welding details clearly and concisely in all important and highly stressed members. For general indications in structural assemblies, the welding symbols of section A-2 of Appendix VII of the General Specifications for Inspection of Material shall be used; in all such cases, a key to the welding symbols shall be included on the drawing.

18. It is of the utmost importance that the details of the spare parts and special tools to be furnished under any requisition, contract or order be clearly shown on both Type B and D drawings. The details of spare parts and special tools for electrical equipment shall be arranged in a list in conformity with the 'List of Spare Parts and Tools' shown on Navy Department specification 42B9. In general, a detailed list of spare parts and special tools to be furnished per vessel, and/or per requisition, contract or order, shall be shown on the general assembly drawing for the equipment in question; in cases where such a list would be too extensive for detailing on the assembly drawing, a separate drawing shall be prepared for this sole purpose. For convenience of the manufacturer, the Bureau will accept a modification of the list of material shown under the preceding sub-paragraph 10, whereby the columns headed "Number required" may be broken down into two columns, one showing number required for assembly purposes and one showing additional parts to be manufactured for spares; but such information on detail plans shall not relieve the contractor from the responsibility for furnishing a detailed summary of spare parts and special tools on the general

assembly drawing or separate special drawing, as the case may require. Final Bureau approval of the spare parts and special tools will be given on the assembly drawing, or special drawing, in each case, and not on detailed drawings. In particular, when sets of spare parts for a particular equipment are called for by the requisition, contract or purchase order, such as "complete sets of bearings," the summary of spare parts shall show in detail what items constitute a set.

19. In all applications of antifriction bearings of ball or roller types, the assembly plan of the apparatus shall bear a certificate signed by a responsible representative of the bearing manufacturing company showing that the application of each particular bearing proposed for use is approved by his company as to all details of mounting shown, the load and speed to which the bearing will be subjected and the lubrication of the bearing, giving full consideration to the intended service, viz, continuous or intermittent, ambient temperature, disassembly requirements, etc.

Sl-1-b. Photographic tracings.

1. Photographic tracing shall be furnished on tracing cloth which is in accordance with Federal Specifications CCC-C-531; white cloth vellum is not acceptable. Photographic tracings shall be right reading and capable of producing a clear and distinct print, and there shall be no distortion nor illegibility of the lines or figured dimensions.

2. Photographic tracings shall be made by an approved photographic process which shall consist of the production of a suitable vandyke negative from the original tracing on special paper; the negative shall then be placed on sensitized tracing cloth and exposed. Following exposure, the tracing cloth shall be passed through a water bath and a developing solution and then carefully wiped clean with cotton or a camels-hair brush to remove foreign or excess substances on the surface.

3. Photographic tracings shall be made with clear, sharp, durable black lines on the dull side of tracing cloth which has been treated with a colorless waterproof coating and sensitized to produce a black line print when exposed under a negative, developed and washed. They shall be of such character as to permit erasures and making alterations in ink with the same facility and degree of permanency as with regular ink tracings. The waterproofing shall withstand at least 20 minutes exposure to water without showing any tendency to break down and shall withstand a sufficient amount of vigorous rubbing necessary to clean out the back ground without disturbing the lines; breaks, cracks, or spots in waterproofing shall be cause for rejection. The waterproof coat shall adhere to the cloth so that it cannot be stripped from the cloth on either side.

4. The surface of photographic tracings shall be dull mat finish, requiring no top coating or lacquer, and shall possess sufficient tooth to take india ink with the same freedom as natural tracing cloth, and without causing the pen to slip or skip or the ink to spread unduly. The finish shall permit india-ink lines to sufficiently penetrate the surface of the cloth so as to resist removal by chafing with the thumb nail, smudging the lines by damp hands under pressure and the wear and tear of frequent handling. Failure to withstand the above shall be cause for rejection.

5. Photographic tracings shall be perfectly smooth and flat when unrolled and show no tendency to pucker or draw. The background of the cloth after printing and developing shall be of a bluish-white tint having a transparency ratio of not less than 65, and the cloth shall retain as nearly as possible the flexibility of natural tracing cloth. Thickness over 0.0043-inch, stiffness or tackiness shall be cause for rejection.

6. All tracings from which photographic tracings are made shall be in such condition as to produce photographic tracings which are satisfactory in every respect.

Sl-1-c. Sizes of drawings.

1. The standard vertical dimension when reading all drawings except types A and C drawings, shall be 27-inches, and the standard length shall be 40-inches, and this standard sheet shall be used whenever practicable. A half size sheet shall be 27-inches in the vertical direction and 20-inches in length, and this size sheet may be used when the standard sheet is not required. If a sheet larger than the standard sheet is essential, the length may be increased as required up to a maximum length of 80-inches. In exceptional cases the vertical dimension may be increased to 40-inches when specifically authorized by the Bureau. For deck arrangements of large vessels and similar plans, where the scale of drawings required to keep within the dimensions of the sheets specified herein, would make the drawing difficult to read, the supervisor of shipbuilding may permit the contractor to exceed the length of 80-inches specified, but the number of such sheets shall be kept at a minimum and specific approval of the supervisor must be obtained in each instance.

2. There is no restriction as to the size of types A and C drawings.



Sl-1-d. Type A drawings.

1. Type A drawings submitted in connection with bids for the building of vessels shall consist of such sketches and plans as may be necessary to amplify the Bureau's original contract plans. Such drawings shall be submitted in duplicate with bids or as required by the invitation for bids.
2. When equipment for vessels is to be purchased directly by the Navy Department, type A drawings in duplicate shall be furnished with the bids, or as may be specifically called for in the requisition or schedule. In any case one set shall be for the files of the Bureau of Ships and the remainder filed as directed by the Bureau of Supplies and Accounts. Type A drawings shall consist of all sketches, cuts, drawings, etc., as may be necessary to show completely the character and design of the material or equipment it is proposed to furnish, and in amplification of the description and guarantees described in the wording of the bid.
3. For apparatus such as turbines, pumps, motors, generators, condensers, boilers, and similar units, sectional plans shall be furnished which show clearly the details of the design, the materials of which the units are to be built, the over-all dimensions, and the space required for operation and overhaul.
4. For equipment such as distilling plants, refrigerating plants, and similar installations a floor-plan arrangement shall be furnished showing the space occupied by the apparatus, the space required for operation and overhaul, and the units which make up the plant. Sectional plans of the principal units containing the information required in the preceding paragraph, and such other information as will permit a clear understanding of the plants and their operation shall be also furnished.
5. Award of contract in connection with which type A plans have been submitted does not carry approval of such type A plans as construction or manufacturing plans but they are subject to modification in the development of type B plans as demanded by the requirements of the specifications and terms of the contract.

Sl-1-e. Type B drawings.

1. Type B drawings shall consist of preliminary diagrammatic and detail working plans of all machinery and equipment prepared in the development of the contract specifications and shall be submitted for approval via the Bureau's inspector with suitable letter of transmittal for each vessel covered, as soon after award of contract as possible and before work covered by such plans is commenced. Before detail working plans are submitted diagrammatic plans of general arrangement of main and auxiliary machinery, piping, light, power, and interior communication systems must be approved. These drawings shall be carefully checked in order to correct omissions, errors, deviations from form, and noncompliances with the specifications before submission for approval via the Bureau's inspector. When drawings in an unsatisfactory condition in this respect are forwarded in sufficient quantity to constitute a definite cause for delay, the Bureau's inspector shall report the circumstances to the Bureau together with such comment as the contractor may care to make. As the working plans are

developed, the shipbuilder shall enter the calculated weights on the plans in accordance with the following general requirements:

- (a) Assembly plans of units and equipment shall have indicated thereon the calculated weight of the assembled unit or piece of equipment. Assembled units of 1,000 lbs. or over shall have the center of gravity indicated. The detail plans of parts forming the assembly shall have notes thereon referring to the assembly plans on which the weights are recorded.
- (b) Piping arrangement plans shall have indicated thereon the calculated weights of the systems. Where applicable, weights of piping systems shall be indicated by subject sub-divisions in accordance with the latest edition of Instructions to Supervisors of Shipbuilding for Recording and Reporting Weights of Finished Machinery.
- (c) Electrical weights for interior communication, fire control, radio, sound, and mine protective systems shall be indicated by circuits and totals for each system. Power and lighting systems need not have weights indicated on the deck plans or feeder lists, but the plans of these systems shall be cross-referenced to a plan covering a summary of the calculated weights for each of these systems.
- (d) The submission of plans for approval shall not be withheld awaiting entry of calculated weights; but these weights shall be determined and entered on the plans as required in the foregoing paragraphs as early as practicable.

2. Type B drawings shall be blueprints furnished in triplicate unless otherwise specified where the equipment covered thereby is entirely under the cognizance of the Bureau of Ships. If other bureaus are involved one additional copy shall be furnished for each of the other bureaus concerned. Of the copies furnished, two shall be retained by the inspector and the remainder shall be forwarded by him to the bureau. Upon receipt of the bureau's action, one of the copies retained by the inspector will be suitably endorsed by him indicating such action and returned to the contractor. Additional copies offered by the contractor will be similarly endorsed on request.

3. Where two or more vessels of the same class are under construction at the works of the same contractor, or where plans are developed by a central drafting room, type B drawings pertaining to equipment common to two or more vessels shall be submitted as for one vessel and the number of blueprints furnished shall be as directed by the bureau. In such case drawings shall show name and designation of all vessels covered and letter of transmittal shall give the same information together with contract number of each vessel.

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4. Type B drawings may be submitted as tracings accompanied by one blueprint for the files of the Bureau of Ships and one for the files of any other bureau concerned. When so submitted the contractor shall furnish the bureau's inspector with one copy for his use, as soon as approved tracing is returned with bureau's approval.

5. Where type B drawings are taken from tracings previously approved by the bureau for other vessels, or are tracings made from approved drawings of other builders a note shall be made of bureau number previously assigned, together with notation "Modified", if modification has been made. If a new drawing is prepared it shall bear a note indicating that it supersedes the previous drawing number.

6. Any alteration made on a type B drawing during the progress of work shall require procedure to obtain approval in the same manner as in the case of the original. Copies of the new or altered drawing, if approval is obtained, shall be supplied as in the case of the original. If alterations are thus authorized and no new drawing is made, the altered drawing shall carry a table of alterations serially numbered and arranged in a table giving date, nature of each alteration, and reference authority for change; such alteration tables shall indicate the character of the original design features which have been altered. The bureau's inspector shall certify approved alterations as in the case of the original drawing.

7. Two blueprint copies on paper of all finally approved type "B" drawings shall be supplied by the contractor with each vessel delivered to take the place of type D drawings, if the complete set of type D drawings is not ready at time of delivery. One set of such blueprints showing the machinery and electrical installations as finally approved shall be delivered to the Commanding Officer of each vessel via the supervisor of shipbuilding, and the other set forwarded via the supervisor to the commandant of each vessel's home navy yard.

8. In the purchase of equipment for vessels directly by the Navy Department, type B drawings shall be furnished for the bureau's action prior to fabrication of any material, unless the contract specifically states otherwise. In such case the method of procedure shall be identical with that outlined above. The drawings shall likewise be forwarded in triplicate with additional copies for each of the other bureaus concerned, unless the contract states otherwise.

#### SI-1-f. Type C drawings.

1. Type C drawings shall consist of such drawings as are necessary to amplify information supplied to sub-contractors with orders, copies thereof being required by the bureau inspectors in making inspection at the works of the sub-contractors.

2. Such drawings may be copies of type B plans previously approved or any other form of drawing the contractor may desire to use. Copies of such drawings shall be furnished complete with each copy of the order. All drawings

shall be clearly marked to show either shipbuilder's order number or Navy contract number to facilitate identification. Orders are required to be submitted to the bureau's inspector in quadruplicate. The bureau's inspector will supply the bureau and other inspectors at the works of sub-contractors with copies as necessary.

3. Orders for steel castings or forgings shall always be accompanied by type C drawings.

Sl-1-g. Type D drawings.

1. Type D drawings shall consist of accurate hand tracings in india ink or photographic tracings on tracing cloth for all finished work, and shall be sufficiently extensive in detail to enable parts of the machinery and electrical installation of a vessel to be duplicated without additional drawings, and shall contain sufficient information to permit any part to be readily identified in orders for replacement; for the latter purpose only, photographs mounted on standard size cloth back sheets with part numbers clearly marked thereon will be acceptable to amplify and simplify, but not to replace the regular assembly drawings. (Except as modified under par. Sl-1-k.)

2. Assembly drawings shall show the name of all major parts of the apparatus or subassemblies which appear on other plans. All clearances affecting the assembling of detail parts shall be clearly indicated, together with any other information required for the proper adjustment of those parts. Any information, not otherwise furnished in instruction books, pertaining to the operation of the apparatus shall be indicated.

3. Where photographic tracings are supplied, reproductions made from the manufacturer's own shop tracings, will, in general, be acceptable. However, whether photographic tracings are made from shop drawing or otherwise, no finished drawings supplied under these specifications shall show any plan or supply any information that is not strictly applicable to the apparatus or equipment for which the drawings are furnished except for certain classes of equipment which are made up of parts of subassemblies, the details of which can be indicated by the procedure specified in subparagraph Sl-1-a-9.

4. For equipment which is required to be in accordance with Navy Department Specifications 17C10, 17C17, 17G7, 17G8, 17M10, and 17M17, the plans shall conform to the requirements specified therein, except that for type D plans, the number of sets, size, arrangements, title, and form shall conform to the requirements specified herein.

5. When a contractor for a given class of equipment is in doubt as to the character of the type D drawings required by the bureau, it is suggested that a representative set of drawings covering a characteristic item of equipment be submitted to the bureau in triplicate for approval. The bureau will then retain one set of such drawings, and return one corrected set to the contractor, and send one corrected set to the bureau's inspector having cognizance, for use in checking drawings delivered on contract.

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6. All type D drawings shall be furnished complete within 4 months after a vessel has been delivered by the contractor unless the contract specifically states otherwise.

7. Where contracts for the construction of two or more vessels of the same design are awarded to one contractor, under contracts for which bids were opened at the same time, original finished tracings or photographic tracings for the bureau and for distribution to Navy Yards are required only as for one vessel, whenever the apparatus covered is identical. If not identical, separate and complete sets of tracings or photographic tracings for the bureau and for navy yards for all items which differ shall be furnished for each vessel so affected. When more than one vessel is covered by a drawing, the designation, name, and contract number for each vessel to which the drawing applies shall appear thereon.

8. Unless otherwise specified, sets of type D drawings shall be furnished in number and for the purpose indicated as follows:

(a) One complete set of hand tracings or photographic tracings for each group of similar vessels on order from the same contractor for the files of the bureau.

(b) Seven complete sets as in (a) above to the bureau's inspector for distribution to navy yards, as directed by the bureau.

(c) One complete set of blueprints for each vessel built containing only the items pertaining to that vessel; this set shall be supplied to the vessel via the supervisor of shipbuilding.

9. The type D drawings furnished for the machinery installation and electrical plant shall be indexed by the shipbuilder. Indexing shall be done with india ink and conform to size and styles shown on Bureau of Ships plan 385691 (see reproduction attached). The index number shall correspond to the official designation of the vessel, the group number shall conform to the Navy Filing Manual, and the file number shall conform to the master index sheets for machinery and electrical plans. Where a set of plans applies to a group of two or more vessels, all plans shall be indexed under the lowest numbered vessel of the group; in special cases where plans do not apply to all vessels of the group, such plans shall be indexed under the lowest numbered vessel of that group, and a notation made in or near the title to designate the vessel or vessels to which the plans are applicable.

10. The bureau will supply a set of blank index forms for type D drawings which will be filled in by the shipbuilder with india ink, after which the shipbuilder will make blue-line print copies of these forms for each set of plans; the indexed forms will be forwarded to the bureau with the set of type D drawings intended for the bureau's files, and set of blue-line copies will accompany each other set of these drawings.

11. Each set shall be wrapped in a waterproof wrapper and be packed separately, ready for shipment, in flat, strong, wooden cases, in which the sheets shall be so secured that it will be impossible for them to be displaced or crumpled during handling. Sets of machinery, electrical, and radio drawings for the same vessel may be boxed together.

12. In the purchase of equipment for vessels by direct contract with the bureau, type D drawings conforming to the requirements of the above paragraphs shall be furnished by the contractor with the delivery of the completed material in number of sets as required by the contract.

13. No type D finished plans will be required for the interior communication equipment listed in subparagraph SI-1-h-6(2).

SI-1-h. Instruction books and pamphlets.

1. Instruction books will be furnished by contractors and sub-contractors for main propelling machinery, boilers, air compressors, main forced draft blowers, centrifugal pumps as required by Subsection S47-2, positive displacement rotary pumps as required by Subsection S47-3 and other auxiliary machinery, electrical installations and other important naval equipment furnished by them. These instruction books will contain all necessary pertinent information to insure efficient and economical use of the equipment, such data and information as may be required by the applicable specifications under which furnished, and in general, the following:

(a) General description, including also sufficient sketches, illustrations, and sectional assemblies with appropriate references to drawing numbers and titles.

(b) Installation instructions.

(c) Operating instructions.

(d) Instructions for care and maintenance.

(e) Safety precautions.

(f) Index.

(g) For interior communication equipment listed in subparagraph SI-1-h-6(2) reproductions of approved type B plans.

The books will be printed on a strong grade of paper using a medium size type so as to render easy reading. The size of the printed page shall be approximately 8-1/2 by 10-1/2 inches.

2. The instruction books shall be covered with a strong durable cover of black leather, leatherette, fabrikoid or similar approved material and shall be bound securely so as to prevent detachment of either the covering or the pages. The size of the cover shall be approximately 9 by 11 inches. The front cover shall contain the following information:

(a) Sufficient descriptive data to enable ready identification.

(b) Name and number of all vessels to which the equipment applies.

(c) Contract numbers under which equipment was purchased. If more than one contract number is shown, the vessels supplied under each contract shall be indicated.

(d) Manufacturer's name and address.

A sample of the complete books shall be submitted to the bureau for approval before final printing.

3. A contractor furnishing more than one set or type of equipment, subject to bureau approval, may incorporate the instruction books of similar or allied equipment in one binder, providing the binder does not become bulky and more difficult to use.

4. The bureau will consider requests by contractors in special cases to furnish descriptive pamphlets instead of instruction books. Such pamphlets shall contain sufficient information to insure that the operating personnel can operate and maintain the equipment properly. The pamphlets shall be bound in a durable cover as described in subparagraph Sl-1-h-2.

5. All copies of instruction books required shall be delivered to the supervisor of shipbuilding prior to the delivery of each vessel. Sufficient copies shall be supplied for distribution by the supervisor of shipbuilding as follows:

(a) Five to the Bureau of Ships.

(b) Ten to the commanding officer of each vessel, in the case of battleships, cruisers, and aircraft carriers, and five for each other type of vessel.

(c) Two to the Superintendent of the United States Naval Academy.

(d) Six books relating only to submarine equipment to the commander, submarine base, New London, Conn., for the submarine school.

(e) In the case of vessels built at navy yards additional books shall be furnished as follows:

(1) Two for the Commandant, Navy Yard, Brooklyn, N. Y.

(2) Three for each building yard.

(f) Two of equipment listed in subparagraph Sl-1-h-6(l) to each navy yard, except Cavite, P. I., Portsmouth, N. H. and Charleston, S. C.

6. Instruction books shall in all cases be furnished for the following types of equipment wherever installed:

- (a) Electrical propulsion equipments for all classes of vessels.
- (b) Oil engines of all types, whether for propulsion purposes or not.
- (c) Gasoline engines of all types.
- (d) Main propulsion turbines.
- (e) All turbines for driving electric generators.
- (f) Propulsion reduction gears.
- (g) Oil-burning equipment.
- (h) Distilling plants.

- (i) Refrigerating plants and boxes.
- (j) Storage batteries, submarine propulsion.
- (k) All auxiliary machinery of new unusual design.
- (l) Interior communication equipment:
  - (1) Electric clocks.
  - (2) Telegraph systems.
- (3) Battery powered telephones.
- (4) Sound-powered telephones.
- (5) General announcing system.
- (6) Under-water log.
- (7) Shaft-revolution indicator system.
- (8) Fire-alarm system.
- (9) Salinity indicator system.
- (10) Automatic telephone system.
- (11) Sound motion picture system.
- (12) Wind direction and intensity system.
- (13) High powered announcing system.
- (14) Electrical character transmission system.

Sl-1-i. Record of electrical installation.

1. Complete information and illustrative matter in connection with the details, layout, test, and operation of all the electrical equipment of a vessel shall be compiled by the contractor and bound by him into a convenient record of the electrical installation; information concerning radio equipment, and the underwater sound system shall not be included, except items connected with the power supply therefor, such as motor generators, etc. Arrangements to include information concerning items of the electrical installation not under the cognizance of the Bureau of Ships shall be made by the contractor with the assistance and to the satisfaction of the supervisor of shipbuilding.

2. In general, the material included shall contain full information in regard to general appearance, details of construction, operation, connections, maintenance, shop test data, and shipboard test data (for standard test forms for electrical tests, see Appendix I) of all electrical machinery, instruments, fittings, appliances, etc., except such as may be covered by bureau standard plans and those excepted by subparagraph Sl-1-i-1. For illustrative purposes, blueprints, photographs, cuts, or other suitable reproductions may be used and these shall be properly numbered or lettered to accompany the text; scales shall not be reduced to a size which would render reproductions difficult to read. Every type of instrument employed in the interior communication and signal systems, as well as generators, motors, controllers, searchlights, rheostats, circuit breakers, storage batteries, switchboards, panels, switchboard instruments, etc., shall be included, with the manufacturer's instructions, testing methods, nomenclature, catalog designation, and ordering instructions therefor. Elementary wiring diagrams shall be included in conjunction with other description and test data for electrical installations. Descriptions and plans of items furnished by the government shall be obtained from the bureau concerned by the contractor and included in the final compilation.



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3. All matter as finally compiled shall be grouped and carefully indexed; the grouping shall be on general lines, as, for example: (a) general, (b) distribution, (c) power, (d) lighting, (e) interior communication, (f) signals, (g) storage batteries, etc. The text may be printed or multigraphed and extracts from manufacturer's catalog covering the apparatus concerned may be bound directly in the record if of convenient size.

4. All copies of the record shall be delivered to the supervisor of ship-building prior to the delivery of each vessel. The records shall be grouped into volumes for distribution on the following described basis:

Record of Electrical Installation

VOLUME I - Description.

NOTE 1. - This shall include all of the required information and illustrative matter.

NOTE 2. - This volume may cover a group of vessels when the matter is common to all the vessels of a group.

VOLUME II - Record of Electrical Tests.

NOTE 3. - This shall include blueprint copies of all of the required authenticated electrical tests' records - factory, supplementary factory and shipboard - of the electrical driven auxiliaries, electrical equipment and electrical installation.

NOTE 4. - This volume will apply to only one vessel.

DISTRIBUTION OF BOUND COPIES

Copies to	Volume I	Volume II
Bureau of Ships	3 (original and 2 copies)	2 (original and 1 copy)
Commanding Officer of each vessel of group	1	1
Commandant or supervisor of ship-building (at building yard as applicable)	1	1
Navy Yards (same as receive finished plans)	7	0
Bureau of Ordnance	1	0
Superintendent of Naval Academy	1	0

NOTE 5. The original reports from which the blueprint copies are made shall be bound in a cover in the same manner as the blueprint copies.

5. Any original tracings or extra copies of subject matter specially prepared for the record by the contractor, shall be finally forwarded to the bureau.

6. Every precaution should be observed to see that none of the information compiled in the record falls into the hands of unauthorized persons; see note at the beginning of subsection.

SI-1-j. Booklet plans of machinery.

1. Information and drawings of the systems hereinafter enumerated shall be prepared by the contractor, and blueprint copies of same shall be bound in suitable paper-backed booklets by him and delivered to the supervisor of shipbuilding prior to the delivery of each vessel. Sufficient copies shall be prepared for distribution by the supervisor of shipbuilding, as follows:

- (a) One to the Bureau of Ships.
- (b) Ten to the commanding officer of each vessel in the case of battleships, cruisers, and aircraft carriers and five for each other type of vessel.
- (c) One to each navy yard.
- (d) Two to the Superintendent of the United States Naval Academy.

2. After all copies have been made the original tracings prepared for the booklets shall be forwarded to the bureau for its files.

3. Drawings for the booklet plans of machinery shall be submitted to the bureau for approval before final tracings. The final form of the drawings supplied shall be as finished tracings on cloth, in sheets 14 by 34 inches with a 1/2-inch margin all around, except on the left edge where a margin of 1-1/2-inches shall be left for binding. No more than one system shall be shown on any sheet, and each system shall be complete. All valves, branches, and connections to main and auxiliary machinery and equipment shall be shown.

4. Drawings shall be clear and distinct and shall show leads of all piping connections and in skeleton diagrammatic arrangement. Copy of bureau's standard drawing may be requested as indicative of what is required. (See bureau type plan 6-Y-374.) At least one tracing showing each of the following systems and connections as installed in plan, and one showing each as installed in elevation shall be furnished. Certain systems may be shown for each deck if desirable.

For all vessels, except submarines:

- (a) Main and auxiliary steam piping.
- (b) Boiler feed; suction, discharge, and make-up feed piping.
- (c) Auxiliary exhaust piping.
- (d) Fresh-water tanks; filling and suction piping.
- (e) Fire and bilge; suction and discharge piping.

- (f) Distilling plant; all piping.
- (g) Refrigerating plant; refrigerant, brine, and water piping.
- (h) Steam heating plant; steam and drain piping.
- (i) Pantry, galley, laundry, and bath; fresh-water supply; steam and drain piping.
- (j) Low-pressure steam drainage; piping and traps.
- (k) High-pressure steam drainage; piping and traps -
- (l) Main turbine glands; steam supply, leak-off piping, and steam-leakage-recovery system.
- (m) Main propelling machinery; lubricating oil supply return and purification system.
- (n) Lubricating oil tanks; filling and suction piping.
- (o) Sea valves; suction and discharge connections.
- (p) Compressed air; deck and machinery supply system.
- (q) Fuel oil; tank filling and suction piping.
- (r) Fuel oil; tank heating system, complete.
- (s) Fuel oil; burner supply piping to boilers, galley incinerator, and other special services.
- (t) Electric cable, electric-propulsion arrangement, generators via control station to motors, excitation and control systems.
- (u) Electric-propulsion switching system.
- (v) Ventilation piping; supply and exhaust for machinery spaces.
- (w) Such other additional systems as the Bureau may specify in the individual case.

NOTE:- For destroyers and other small types of vessels where any of the above enumerated systems are not extensive, two or more can be combined and shown on the same sheet if convenient.

5. For heavy-oil engine installations (submarines), items (d), (f), (g), (h), (i), (n), (o), (q), (s), (t), and (u) shall be furnished as given in the foregoing subparagraph and the following additional items:

- (a) Forced lubrication and piston cooling; supply, return, and purification system.
- (b) Compressed air; scavenging, supercharging, and starting system.
- (c) Compressed air; ship's high-pressure system.
- (d) Compressed air; ship's low-pressure system.
- (e) Automatic fuel compensating system.
- (f) Main and auxiliary water systems.

6. In addition to the foregoing plans, general data for all vessels shall be supplied made up on a similar tracing, and a general synopsis of the official contract trials. The latter will be furnished to the contractor by the bureau, via the supervisor of shipbuilding. The general data required shall include the following items, covering dimensions and outstanding characteristics:

- (a) Hull.
- (b) Propelling machinery.
- (c) Shafting and bearings.
- (d) Propellers.
- (e) Boilers.
- (f) Pumps.
- (g) Auxiliary machinery.
- (h) Condensers and vacuum equipment.
- (i) Lubricating oil capacity and storage.
- (j) Fuel capacity and storage.
- (k) Fresh-water capacity and storage.
- (l) Speeds and performance characteristics on official trials.

Sl-1-k. Type B and D drawings - list of plans.

1. In order to obtain uniformity in the preparation of type B, and particularly type D drawings, the following lists of subject items for such drawings are given. For certain vessels some items listed do not apply; for others, necessary items may have been omitted. The lists are not intended to be exhaustive but are furnished only as a general guide; omission of any important item shall not be construed to relieve the contractor of the responsibility for furnishing either type B or type D drawings; pertaining to same if required. It is understood that these items are meant to include only work which is under the cognizance of the Bureau of Ships.

2. For the following items, arrangement or assembly drawings will be required with such detail drawings or information as are necessary for a clear understanding of the item and to permit reproduction of parts which are subject to wear or breakage and which may require replacement. The details of parts may be made on the same sheet as the arrangement or assembly plan, may be in form of a descriptive note, or may be on one or more separate sheets.

- (a) Bilge drainage system, machinery spaces.
- (b) Blacksmith shop.
- (c) Feed regulators.
- (d) Fire extinguishers, machinery spaces (steam).
- (e) Floor plates, machinery space.
- (f) Forced-draft system.
- (g) Foundations, important machinery.
- (h) Foundry.
- (i) Gear, locking, main and bilge injection, distance, valve operating.

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- (j) General workshop.
- (k) Gratings, machinery spaces.
- (l) Guards, main propulsion units.
- (m) Heating system:
  - (1) Steam, living spaces.
  - (2) Coils, fuel-oil tanks.
- (n) Indicators:
  - (1) Temperatures.
  - (2) Fuel-oil tank gage.
  - (3) Smoke.
- (o) Ladders, machinery spaces.
- (p) Lagging and heat insulation.
- (q) Oil purification apparatus.
- (r) Piping.
- (s) Protective devices, electric propulsion controls.
- (t) Shop arrangements.
- (u) Sirens, steam (arrangement of piping and mechanical pulls).
- (v) Smoke pipes.
- (w) Switching structure, electric propulsion control.
- (x) Tanks, air.
- (y) Trial equipment.
- (z) Uptakes, boiler.
- (aa) Valves:
  - (1) Sentinel.
  - (2) Sluice, gate.
- (bb) Ventilating system, machinery spaces.
- (cc) Whistles, steam and electric (arrangement of piping and mechanical pulls).

3. For the following items, assembly and complete detail plans will be required:

- (a) Air accumulators:
  - (1) Compressors.
  - (2) Ejecting apparatus for condensers.
  - (3) Flasks and plugs, Diesel engines.
  - (4) Starting and reversing gears, Diesel engines.
- (b) Augmenters, vacuum.
- (c) Bearings:
  - (1) Main shafting.
  - (2) Main thrust.
  - (3) Turbine thrust.
- (d) Blowers:
  - (1) Ventilating, electric propulsion equipment.
  - (2) Forced draft, fire rooms.
  - (3) Soot.
- (e) Boilers:
  - (1) Auxiliary.
  - (2) Main.
- (f) Bolts, holding down, main propulsion units.
- (g) Cables, electric-propulsion units.
- (h) Circuit breakers.
- (i) Clocks, electrical.

- (j) Clutch gear, main propulsion.
- (k) Condensers.
- (l) Coolers.
  - (1) Air.
  - (2) Oil.
  - (3) Water.
- (m) Distilling plant and auxiliary equipment.
- (n) Eductors.
- (o) Engines, main propelling.
- (p) Expansion couplings, shaft.
- (q) Expansion joints for piping.
- (r) Fair-waters.
- (s) Filters, lubricating oil.
- (t) Gages:
  - (1) Bridge.
  - (2) Turbine clearance.
- (u) Gear, lifting:
  - (1) Lifting, for important machinery.
  - (2) Operating:
    - (a) Main engines.
    - (b) Smoke pipe.
    - (c) Damper.
    - (d) Valve.
  - (3) Turning or jacking, main propulsion units.
- (v) Generators, main propelling.
- (w) Governors:
  - (1) Auxiliary units.
  - (2) Main propulsion units.
- (x) Grease extractors.
- (y) Heaters:
  - (1) Water.
  - (2) Oil.
- (z) Indicator gear:
  - (1) Auxiliary units.
  - (2) Main engines.
- (aa) Indicators:
  - (1) Revolution.
  - (2) Salinity.
- (bb) Insulators, electric propulsion cable.
- (cc) Interlocks, electric propulsion.
- (dd) Lubrication:
  - (1) Auxiliary units.
  - (2) Main propulsion units.
- (ee) Mandrels for white metal, main bearings.
- (ff) Manifolds and all important piping.
- (gg) Meters, torsion.
- (hh) Micrometer gear, main propulsion units.
- (ii) Motors, electric propulsion.
- (jj) Mufflers, exhaust, Diesel engines.
- (kk) Oil fuel system.

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- (ll) Packing:
  - (1) Gland:
    - (a) Auxiliary turbine.
    - (b) Main turbines.
  - (2) Metallic, main engines.
- (mm) Potheads, propulsion cables.
- (nn) Propellers.
- (oo) Pumps.
- (pp) Reduction gear, main propulsion units.
- (qq) Refrigerating plant.
- (rr) Relays, electric propulsion control.
- (ss) Rheostats, electric propulsion control.
- (tt) Separators:
  - (1) Oil.
  - (2) Steam.
- (uu) Shafting, main propulsion.
- (vv) Strainers:
  - (1) Macomb.
  - (2) Oil.
  - (3) Steam.
- (ww) Stuffing boxes:
  - (1) Bulkhead:
    - (a) Pipe.
    - (b) Shaft.
  - (2) Main engine.
  - (3) Stern tube.
- (xx) Switchboards, electric propulsion control.
- (yy) Switches, electric propulsion control.
- (zz) Tanks:
  - (1) Air.
  - (2) Feed and filter.
  - (3) Ice making.
  - (4) Oil.
- (aaa) Tools, special.
- (bbb) Transformers, electric propulsion.
- (ccc) Turbine, special control, main propulsion units.
- (ddd) Turbines:
  - (1) Auxiliary.
  - (2) Main propulsion.
- (eee) Valves:
  - (1) Boiler blow.
  - (2) Check.
  - (3) Feed stop and check.
  - (4) Composition gate above 2-1/2-inches (where not standard).
  - (5) Composition globe, angle and cross above 2-1/2-inches (where not standard).
  - (6) Injection.
  - (7) Reducing or regulating.
  - (8) Relief.
  - (9) Safety, boiler.
  - (10) Sea.
  - (11) Spring-loaded or pressure-regulating, exhaust.
  - (12) Stop, boiler.
  - (13) Throttle.
  - (14) Toggle operated stop and cut out valves in the main steam lines.

4. For certain classes of equipment, such as those where mechanical fit is not an object, where it may be manifestly impracticable for the manufacture of replacement parts to be attempted by naval personnel, or where the item in question is in accordance with approved naval standards or so standardized industrially as to be readily obtainable by purchase in practically any United States port, types B and D drawings in the form specified above will not be required. In lieu of hand tracings or photographic tracings, however, sufficient information shall be supplied by photographs, illustrations, printed matter, etc., to enable the equipment in question to be readily understood and to permit all parts to be ordered for replacement. The following list of items is given as indicative of equipment covered in this subparagraph:

- (a) Bolt forciers.
- (b) Calorimeters.
- (c) Chain blocks.
- (d) Cleaners, tube.
- (e) Clocks, nonelectrical.
- (f) Electrical metering instruments, switchboard and portable.
- (g) Flue-gas analyzing outfits.
- (h) Fuses.
- (i) Gages (steam, vacuum, air, water, and oil) except special types.
- (j) Indicators:
  - (1) Diesel engine.
  - (2) Steam engine.
- (k) Instruments, electric propulsion.
- (l) Joints, universal.
- (m) Machine tools (except motors and other electrical equipment).
- (n) Meters:
  - (1) Oil.
  - (2) Water.
- (o) Pipe fittings.
- (p) Pyrometers.
- (q) Springs.
- (r) Thermometers.
- (s) Transformers, instruments.
- (t) Tools:
  - (1) Hand (except special wrenches, etc.)
  - (2) Machine (except motors and other electrical equipment).
  - (3) Workshop.
- (u) Traps, except vacuum traps for turbine drainage.
- (v) Valves:
  - (1) Made from bureau standard plans, Bureau of Ships (INT) specifications, Navy Department specifications, or Supplementary General Specifications, except toggle operated stop and cut-out valves in main steam line.
  - (2) Composition gate, globe, angle and cross, 2-1/2-inches and under.



5. The following items for plans of electrical installation of vessels are listed to be furnished by the contractor:

(a) Power system:

- (1) Elementary diagram of power distribution system (refer to type and contract plans. See also subpar. SI-1-k-5(e)(1)).
- (2) Electrical data for motor driven auxiliaries (standard form, Bureau drawing 9-S-4729-L).
- (3) Power analysis and summary of feeders (standard form for A.C. Bureau drawing 9-S-4704-L. See also subpar. SI-1-k-5(g)(5)).
- (4) Isometric wiring diagram of Battle and General systems.
- (5) Isometric wiring diagram of Emergency system (including portable storage battery leads and charging circuits).
- (6) Elementary diagram of bus tie feeders between switchboards, generator cables and shore connection cables.
- (7) Elementary diagram of control, interlock and indicating connections (circuits) between switchboards.
- (8) Elementary diagram of vent sets power and control, and vent system closures and control.
- (9) Elementary diagram of electric furnace power and control.
- (10) Elementary diagram of all systems of remote control of circuits.
- (11) Elementary diagram of control and starting circuits of emergency generator starting.
- (12) Isometric diagram of heating, starting, and radio testing installations.
- (13) Isometric wiring diagram of power circuits in gun turrets and mounts.
- (14) Isometric wiring diagram of cable leads for main propulsion (also an elementary wiring diagram).
- (15) Working wiring deck plans.
- (16) List of feeders and mains of Battle, General, and Emergency systems (standard form Bureau drawing 9-S-4746-L).
- (17) List showing switch arrangements, loads, fusing, etc., of distribution panels.
- (18) Summary list of all storage batteries on vessel showing charging arrangements.
- (19) Complete list of transformers with load data.

(b) Lighting system:

- (1) List of lighting fixtures and appliances with symbols (standard form, Bureau drawing 9-S-4905-L. See also subpar. SI-1-k-5(b)(15)).
- (2) Isometric wiring diagram of Battle and General systems.
- (3) Isometric wiring diagram of Emergency system.
- (4) Outline plan of vessel showing exact locations of all search-lights, running, anchor, and signal lights.
- (5) Elementary wiring diagram of running, anchor, and signal lights.
- (6) Isometric wiring diagram of running, anchor, and signal lights.

- (7) Isometric wiring diagram of lighting circuits in gun turrets and mounts and torpedo mounts.
- (8) Plan showing locations of all flight deck lights.
- (9) Elementary diagram of circuits of all flight deck lights.
- (10) Elementary diagram of control of all flight deck lights.
- (11) Elementary diagram of control of hangar deck lighting.
- (12) Elementary diagram of remote control of general lighting.
- (13) Working wiring deck plans.
- (14) List of feeders and mains of Battle, General, and Emergency systems (standard form, bureau drawing 9-S-4745-L).
- (15) List showing switch arrangements, loads, fusing, etc. of distribution panels.
- (16) Load, analysis and summary of feeders (standard form for A. C. bureau drawing 9-S-4704-L. See also subpar. S1-1-k-5(a)(3)).
- (17) Summary of lighting system equipment (standard form, bureau drawing 9-S-4905-L. See also subpar. S1-1-k-5(b)(1)).
- (18) Illumination survey data (standard form, bureau drawing 9-S-4901-L).

(c) Interior-communication and fire-control systems:

- (1) Elementary wiring diagram of each interior-communication and fire control system. The Government will supply type B and type D plans of elementary wiring diagrams of self-synchronous fire-control circuits.
- (2) Diagram of current supply to interior-communication switchboards.
- (3) List of voice-tube outlets.
- (4) List of telephones (sound powered, automatic announcing).
- (5) Isometric wiring diagram of each interior-communication and fire-control system.
- (6) Load summary of all circuits emanating from interior-communication switchboards (standard form, bureau drawing 9-S-5112-L).
- (7) Deck plans (1/4-inch scale on surface ships, 3/8-inch scale on submarines); separate sets of plans for interior-communication and fire-control systems.
- (8) Summary of interior-communication and fire-control equipment (standard form, bureau plan 9-S-5113-L).
- (9) Plans showing the mounting arrangements in the ship of:
  - (a) Shaft revolution transmitters.
  - (b) Underwater log rodmer and transmitter.

(d) General plans for all miscellaneous electrical systems and installations in the following spaces (these plans are in addition to those submitted as purely general arrangement plans for joint approval of the bureau concerned):

- (1) Wireways.
  - (a) Wireway deck plans. - Composite for all systems - power lighting, I.C., F.C., radio, sound, steering gear selsyn, etc. including thereon the following minimum information:
    - (1)' Location of runs.
    - (2)' Approximate space dimensions of runs.
    - (3)' Designation of methods of support used for each section of runs.

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- (4)' Designation of sections (and plan numbers for same) for which wireway details are shown on separate plans.
- (5)' Cables in the runs - showing for each:
  - (a)' Circuit number.
  - (b)' Cable type and size.

These plans shall be developed in collaboration with the development of the machinery arrangement (and prior to fixing such arrangement), so as to insure compliance with all cable arrangement (including circuit trunking) and installation specification requirements, allotment of space, etc.

- (b) Wireway details. - As necessary, including the following minimum information:
  - (1)' Arrangement (vertical) of cables in main wireway racks.
  - (2)' Arrangement in gun-director trunk.
  - (3)' Arrangement of gun mounts.
  - (4)' Wiring tunnels.
  - (5)' Arrangements at important locations, such as engine and fireroom bulkheads, vicinity of main switchboards I.C. and F.C. switchboards, etc.

NOTE: - Detail data such as shop drilling data for stuffing tubes in decks and bulkheads, etc., are not required for type B and D plans.

The nature of these plans (wireway details) will not permit specific checking for complete approval by the bureau, and therefore the local supervisor of shipbuilding will act on such plans, and by close follow up shall be responsible for designs and installation being in as full compliance as practicable with the requirements and intent of the applicable specifications. Also in this connection, regardless of whether shown on detail plans or not, departures from specifications (including standard installation methods) will be approved by the supervisor of shipbuilding upon installation only in instances where the installation is such that such departure is necessary. Copies of such plans given local approval shall be furnished for the information and files of the bureau. Any particular matters in connection with these matters (wireway details) on which the bureau's decision is considered necessary, shall be submitted with full particulars and recommendations.

- (2) Dynamo flats. - Diesel engine generator rooms - switchboard rooms - etc. (to show arrangements of generator sets, rheostats, voltage regulator units, switchboards).
- (3) Storage-battery compartment and arrangement of battery-charging station.
- (4) Arrangement of electrical workshop.
- (5) Steering-gear room.
- (6) Turrets and mounts.
- (7) Turret.
  - (a) Column and base.
  - (b) Castings.

- (8) Torpedo tubes.
- (9) Torpedo rooms.
- (10) Refrigerating plant spaces.
- (11) Machinery spaces.
- (12) Boiler rooms.
- (13) Motor rooms.
- (14) Bridge.
- (15) Central station.
- (16) Chart house.
- (17) Conning tower.
- (18) Armored access and wiring tubes.
- (19) Control rooms.
- (20) Maneuvering rooms.
- (21) Fire-control and director stations.
- (22) Gyro rooms.
- (23) Interior-communication room.
- (24) Cable installations at exposed guns and directors.
- (25) Masts.
- (26) Pilot house.
- (27) Plotting rooms
- (28) Photographic laboratory.

(e) Miscellaneous.

- (1) Schedule of type B plans of electrical installation. - This schedule shall consist of a tabulation of the plans required of the electrical installation of the vessel or vessels concerned; listing in parallel columns: (a) The titles; (b) the contractors plan numbers (with column for alteration numbers); (c) the Bureau of Ships plan numbers (with column for alteration numbers; (d) the estimated date of submission for approval and (e) remarks; additional columns may be added to suit the contractors convenience.
- (2) A plan listing all methods of supporting cables, fixtures, panels, appliances, etc., by bureau plan, alteration, and method numbers as used; and delineating any proposed methods which are departures from the bureau standard methods. Also plans shall be furnished of any nonstandard (special) fixtures and appliances used.
- (3) Diagrammatic wiring plan of power and lighting systems and diagram of connections of generator and distribution switchboard as required for proper care and operation of the electric plant. (Refer to subpar. Sl-1-k-5(a)(2)). The plans shall be reduced to a size that is legible and can conveniently be handled, and mounted in one of the following ways:
  - (a) On sheet metal or other suitable rigid material and covered with a transparent sheet. These plans shall be uniform in size and mounted in a suitable case so that they can be hinged or slipped out for inspection. The individual sheets shall not be removable.
  - (b) As photo reproductions on linen-cloth sheets of uniform size suitable for keeping in plan book form. The book shall consist of steel binders, approximately 20 inches x 12 inches overall covered with artificial leather with title of book and

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name and number of vessel or vessels stamped thereon in gold letters. One book to be permanently located at each main and emergency switchboard and one in the Log Room.

- (4) List of electrical weights showing manufacturer's or contractor's drawing numbers, bureau drawing numbers, quantity, unit weights, and total weights, in pounds, of all electrical material installed, whether furnished by the contractor or bureau. (Bureau standard form, bureau drawing 9-S-3617-L.)

(f) All electrical apparatus and equipments. (Refer to detail requirements of applicable Subsections of General Specifications for Machinery, Supplementary General Specifications for Machinery, Bureau of Ships (INT) specifications, and Navy Department specifications.)

6. The following type B and D plans of the radio installation in vessels shall be furnished by the shipbuilding contractor. Type B radio plans should be submitted for approval separate from all other plans and in any order desired. It is not intended that the approval of radio plans will, in any way, affect the plans of the electrical, interior communication, underwater sound, or other equipment installed in radio spaces. All plans required hereunder shall be indexed under file Group S67.

(a) Wiring:

- (1) Elementary diagram of complete radio installation in vessel (exclusive of broadcast receiving antenna distribution system).
- (2) Isometric diagram of complete radio installation in vessel (exclusive of broadcast receiving antenna distribution system).
- (3) Elementary diagram of complete radio broadcast receiving antenna distribution system.
- (4) Isometric diagram of radio broadcast antenna distribution system.

(b) Arrangement:

- (1) General arrangement of each radio space in vessel (including radio central, radio transmitter room, emergency station, direction finder stations, motor-generator rooms, etc., where applicable).
- (2) General arrangement of all topside transmitting and receiving antennas (including rod, whip and special types).
- (3) General arrangement of antenna trunks and lead-ins and/or transmission lines.

(c) Miscellaneous:

- (1) Detailed plans and/or instruction books for all radio equipment or special material furnished by the contractor. (Detailed plans and instruction books of "Government Furnished" radio equipment are not required to be furnished by the shipbuilding contractor).
- (2) List of all items of equipment comprising the complete radio installation.

7. The shipbuilding contractor shall furnish the following type B and D plans of the underwater sound and electric visual signalling installations. The type B plans of these two systems should be submitted for approval separate from all other plans and in any order desired. It is not intended that the approval of

communication or other equipment installed within the same space as the underwater sound equipment. The plans required hereunder of the electric visual signalling equipment shall be indexed under file Group S66 and those of the underwater sound system under file Group S68.

(a) Wiring:

- (1) Elementary diagram of the complete electric visual signalling system.
- (2) Isometric diagram of the complete electric visual signalling system.
- (3) Elementary diagram of the complete underwater sound system.
- (4) Isometric diagram of the complete underwater sound system.

(b) Arrangement:

- (1) Arrangement plan indicating the location of each unit of the electric visual signalling system.
- (2) Arrangement of each underwater sound space and of other spaces in which units of the underwater sound are installed, including sea chests and hull fittings.

(c) Miscellaneous:

- (1) Detailed plans and/or instruction books for all electric visual signalling and underwater sound equipment or associated special material furnished by the shipbuilding contractor. (Detailed plans and instruction books of "Government Furnished" equipments are not required to be furnished by the shipbuilding contractor).
- (2) List of all items of electric visual signalling and underwater sound equipment comprising the complete installation.

Sl-1-2. Electrical plan requirements.

1. Plans showing runs of wire leads and structural work together shall have the wire leads shown as heavy lines, and structural work (outlines of decks, bulkheads, etc.) in light lines.

2. All working deck plans and general arrangement plans showing electrical wiring, shall have all structural work shown (such as doors, hatches, skylights, stanchions, coal chutes, manholes, removable plates, together with their names and compartment numbers, etc.) which might in any way affect the run of the electrical wireways.

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3. The symbols used on plans to indicate types of appliances, fixtures, etc., shall be in accordance with Bureau of Ships standard plan 9-S-3744-L. Each plan on which appliances, fixtures, etc., are shown by a symbol shall, for convenient identification, have on it a table which shall show in parallel columns each symbol used with its name and/or descriptive identification; this applies in particular to isometric and working wiring deck plans. All cables shown on plans shall be identified in accordance with Subsection S28-2. Where bureau standard forms are available they shall be followed in the preparation of plans.

4. Working wiring deck plans shall be of 1/4-inch scale on surface vessels and 3/8-inch scale on submarines; or larger as required for satisfactory legibility. These plans shall be submitted after diagrammatic (elementary and isometric) plans have been approved, and shall show the proposed location and type of fixtures, approximate location of motors and motor generators, fans, I.C. instruments, and all other electrical apparatus, complete wiring, nature of wireways, and all appliances, such as feeder junction boxes, feeder distribution boxes, distribution boxes, switches, receptacles, etc.

5. Each system wiring plan shall have a reference plan table referring to all other plans of the system (this includes elementaries, isometrics, deck and feeder lists); this table shall list in paralleled columns both the contractors and bureau numbers and alterations of each. In the case of deck plans, one of the decks (preferably Hold-Ford) only, shall bear the list of reference plans and their respective alteration numbers - in case of alteration to one of the system plans, it will therefore be necessary only to change the alteration numbers of reference plans on only this single deck plan.

6. The schedule of plans of electrical installation and the elementary diagram of the power distribution system shall be submitted at the earliest practicable date after award of contract. All power systems lighting system, and general plans as listed in subparagraph Sl-1-k-5 shall be submitted for approval in the general order stated in that subparagraph.

7. On elementary and isometric wiring diagrams and on deck plans, the extensive use of single lines to represent several cables, is unsatisfactory; a limited use of single lines for this purpose will be satisfactory. However, this shall be limited to instances where a group of leads start at one point (as at a panel or terminal board) and all proceed in the same direction to end in one general vicinity - and in these instances there should be no branches off the main single line run; wherever the single line scheme is used the leads shall be carefully labelled at each end of the single line where they are again separated.

8. All interior-communication and fire control plans shall be submitted for approval in the order stated in subparagraph S1-1-k-5 and on separate sheets. One system only shall be shown on a sheet. Additional plans which may be necessary to show special features or points not otherwise clear shall be submitted as required. Deck plans shall show general arrangement and wireways, including location of junction boxes, distribution boxes, and other principal wiring appliances. There shall be furnished sheets containing general summary of the interior-communication and fire control instruments, accessories, and wiring appliances, giving both contractor's and bureau drawing numbers.

9. The diagrams on lists of lighting feeders and mains shall show the number of each and every circuit and circuit section (feeders, mains, submains, and branches). In this numbering care must be exercised in order to leave numbers available in sequence for each spare connection in a box (each spare on a box should be shown by a stub line). Also the deck plans shall show the number of each circuit (feeders, mains, submains, and branches) which passes through a deck bulkhead, or barrier or out of the same compartment from which it is fed; refer to Subsection S28-2. This marking is intended to provide proper identification of the circuits, so as to facilitate the tracing of the circuit after installation.

10. The approved type B plans of the electrical installation shall be followed in making the actual installation except as modified by this paragraph and any major developments or deviations therefrom - which are approved locally by the supervisor of shipbuilding or the navy yard - shall be accompanied by immediate alteration of the approved type B plans involved to show such departures. By major developments or deviations is meant changes which if not shown would lead to confusion in checking or tracing a circuit or fittings. Since the installation as actually made will be in strict conformity with and shown in all important details on the type B plans, which will thus include all such major developments and alterations made and approved by local authority, it is contemplated that new tracings made of such type B plans will be furnished as the type D drawings required under paragraph S1-1-g. It shall be noted in particular, that on this basis it will not be necessary to make wiring deck plans from the work to show exact locations of cables, fixtures, etc. - it being considered sufficient that the wiring installation plans shall have cables, fixtures, appliances, etc., shown in the proper compartments in their approximate locations, irrespective of exact location, as in the case on the type B plans. No type D finished deck plans will be required of the interior-communication and fire-control systems. Where one set of type D finished plans are furnished for more than one vessel of a group, all major departures for any individual vessel or vessels shall be clearly indicated by notes on the basic plan, or by such supplementary plans as may be necessary if such departures are extensive.



11. The general plans, required by paragraph Sl-1-k-5(d), items 2 to 28 inclusive, shall be entitled "General arrangement of electrical equipment in - - - - -" and shall include the following minimum information:

- (a) Outline views of all electrical equipment in the compartment (shown in heavy weight lines).
- (b) Location of all stanchions, hatches, doors, vent ducts, beams, manholes, salt water pipes, fresh water pipes, etc.
- (c) Outline views of all other equipment in the compartment, such as Diesel engines, turbines, etc. (shown in light weight lines).
- (d) Outline views only of wireways. Individual detail run of cables are specifically not desired.
- (e) A small scale sketch showing the relation of the compartment to surrounding compartments, including accesses, etc.

Where plans showing the detail run of individual cables in the various compartments are required by the shipyard they shall be entitled - "Arrangement of wiring installation in - - - - -". These plans should not be forwarded to the bureau for approval or file unless specifically requested.

Sl-1-m. Radio plan requirements.

1. Wiring:

- (a) The elementary wiring plan of the complete radio installation in a vessel should preferably be on one sheet and include all radio apparatus to be installed in all spaces. No other apparatus or wiring except radio should be included on this plan. Each space, in which radio apparatus is to be installed, should be indicated on plan by an outlined area appropriately labeled and each unit of the various equipments indicated therein by block method. Each cable between units within a space and between spaces may be indicated by single heavy lines. Single lines to represent more than one cable should not be used. Each lead shall be marked with cable type and designation. Power supply wiring between the radio power panels and the apparatus, or receptacles therefor, shall be included. Transmitter remote control, radiophone, frequency meter and receiver extension circuits and antenna bus circuits, shall be in accordance with type plans furnished by the bureau. Inter-connection of equipments shall be in accordance with installation plans or instruction books furnished by the manufacturers of the equipments or by the bureau.
- (b) The isometric wiring plan of the radio installation should include only that portion of the different decks traversed by the radio cables and transmission lines. All cables between radio spaces, radio direction finder stations, remote control stations, motor-generator spaces, etc., shall be included on this plan. All leads shall be marked with cable type and designation to agree with the elementary wiring plan.

- (c) The elementary wiring plan of the radio broadcast receiving antenna distribution system shall include all wiring between antenna and all outlets. The locations of antenna transformers, amplifiers, filters, branch transformers and all outlets shall be indicated on plan. Cable types and designations shall be indicated. If space permits, the isometric wiring diagram may be included on same plan with elementary wiring. The runs of all cables and the locations of all units of the system shall be shown on the isometric diagram. (See subsection S67-1).

## 2. Arrangement:

- (a) A plan view and an elevation view of each bulkhead, in which radio apparatus or material is concerned, should be shown for each radio space, main communication station, coding room, direction finder station, motor-generator room or other space in which an appreciable amount of radio equipment is installed. Spaces in which only remote station units, such as radiophone, key-control and jackbox units are installed, need not be included on radio arrangement plans. All radio equipment and material should be indicated by heavy lines. Structural members, ventilating ducts, piping, electrical equipment, interior communication equipment and all other apparatus or material, which may or may not affect the arrangement of radio equipment, should be indicated in outline by light lines. No wiring except antenna busses, and connecting leads thereto, should be shown on arrangement plans.
- (b) Arrangement plans of topside antennas shall include an elevation view (profile) and a plan view if necessary to clearly show all antennas. The plan(s) shall show all transmitting, receiving and direction finder sense antennas and their lead-ins to the point of entrance. Routing, points of attachment, yardarms, outriggers, pendants, insulators and size, type and length of wire or cable should be indicated on these plans.
- (c) Arrangement plans of antenna trunks shall show the routing, size, length, size of conductor, type and number of supporting insulators and number of access openings.

## 3. Miscellaneous:

- (a) Detailed plans and instruction books shall be furnished covering all radio equipment furnished by the contractor, except where specifically waived. This requirement is not intended to include minor items of incidental installation material such as cable, stuffing tubes, clamps, brackets, etc., but only major items of radio apparatus furnished by the contractor. Plans shall include sufficient details to permit manufacture therefrom. Instruction books shall include sufficient information to permit installation, operation and maintenance by Navy personnel. The books should be submitted to the Bureau for approval.

- (b) The list of radio equipment plan shall include information grouped under the following headings where applicable - Symbol or symbol number (or both), quantity, navy model or type; description, serial number, supply voltage, ship's power required, weight, Bureau drawing number, manufacturer's drawing number, remarks, and any other information desired added by the contractor.

Sl-1-n. Underwater sound and visual signalling plan requirements.

1. Wiring:

- (a) The elementary wiring plan of each complete underwater sound and visual signalling installation in a vessel should preferably be on one sheet and include the apparatus to be installed in all spaces or locations. No other apparatus or wiring except underwater sound or visual signalling should be included in these plans. Each space, in which the apparatus is to be installed, should be indicated on plan by an outlined area appropriately labeled and each unit of equipment indicated therein by block method. Each cable between units within a space and between spaces shall be indicated by single heavy lines. Single lines to represent more than one cable should not be used. Each lead shall be marked with cable type and designation. Power supply wiring between the power panels and the apparatus shall be included. Interconnection of equipment shall be in accordance with installation plans or instruction books furnished by the manufacturer of the equipment or by the Bureau.
- (b) The isometric wiring plans of the underwater sound and visual signalling installations should include only that portion of the different decks traversed by the cables. All leads shall be marked with cable type and designation to agree with the elementary wiring plan.

2. Arrangement:

- (a) A plan view and an elevation view of each bulkhead, in which underwater sound apparatus or material is concerned, should be shown for each underwater sound space, motor-generator room or other space in which an appreciable amount of sound equipment is installed. All sound equipment and material should be indicated by heavy lines. Structural members, ventilating ducts, piping, electrical equipment, interior communication equipment and all other apparatus or material, which may or may not affect the arrangement of sound equipment, should be indicated in outline by light lines.

- (b) Arrangement plans showing the electrical visual signalling equipment shall show location of the 12-inch and 24-inch searchlights in plan view and all interferences in elevation to show coverage of each light.

### 3. Miscellaneous:

- (a) Detailed plans and instruction books shall be furnished covering all underwater sound and visual signalling equipment furnished by the contractor, except where specifically waived. Plans shall include sufficient details to permit manufacture therefrom. Instruction books shall include sufficient information to permit installation, operation and maintenance by Navy personnel. The books should be submitted to the Bureau for approval.
- (b) The list of underwater sound and visual signalling equipment plan shall include information grouped under the following headings where applicable - symbol or symbol number (or both), quantity, navy model or type, description, serial number, supply voltage, ship power required, weight, Bureau drawing number, manufacturer's drawing number, remarks, and any other information desired added by the contractor.

#### Sl-1-o. Symbols for electrical installation of vessels.

1. Symbols used on drawings to indicate type of appliances, etc., shall be in accordance with Bureau of Ships plan No. 9-S-3744-L, revised to date of bid.

#### Sl-1-p. Inspection and performance acceptance tests.

1. Unless otherwise specified, the inspections and tests made in accordance with the requirements of the applicable specifications shall be recorded in a complete test report as hereinafter stated. These reports may be made on manufacturer's or contractor's test forms, except when Standard Forms (See Appendix I) have been prepared by the Bureau.

2. The inspections and tests which may be required by the applicable specifications and which shall form the basis of test reports are as follows:

- (a) Separate tests of driving or driven units.
- (b) Combined assembly tests of driving and driven units.

3. For all combined assembly tests, each performance acceptance test report shall include:

- (a) Test report of driving unit. For alternating-current motors refer to Navy Department Specification 17M10 and Factory Test Record, Form I.N.M. 34. For direct-current motors refer to Navy Department Specification 17M17 and Factory Test Record, Form I.N.M. 21.

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- (b) Test record of controller (if involved). For alternating-current controllers, refer to Navy Department Specification 17C10 and Factory Record, Form I.N.M. 35. For direct-current controllers refer to Navy Department Specification 17C17 and Factory Record, Form I.N.M. 23.
- (c) Test record of generators (if involved). For alternating-current generators, refer to Navy Department Specification 17G8 and Factory Record, Form I.N.M. 36. For direct-current generators refer to Navy Department Specification 17G7 and Factory Record, Form I.N.M. 22.
- (d) Test record of driven unit, including copies of all recorded test data and characteristic curves plotted therefrom (where required).
- (e) Test report of the combined assembled unit, including a definite report on the suitability of the driving unit (and controller, if furnished) for its specific application and harmony of assembly of all independent units going to make up to the complete equipment. For motor-driven units refer to Factor Record, Form I.N.M. 34a.

4. Distribution of complete test reports on the combined assembled units shall be as follows:

- (a) Two to Bureau of Ships.
- (b) One to each vessel concerned (to be forwarded via supervisor of shipbuilding or commandant of the building yard).
- (c) Two to each supervisor of shipbuilding (one for the supervisor's files, the other for the shipbuilder), for privately built ships.
- (d) One to commandant of each building yard concerned, for navy yard built vessels.
- (e) One for primary district inspection office.
- (f) One for branch inspection office (if any).

Edge of plan

### LIST OF MATERIAL

(Quantities are for 1 globe valve)

1' →

Piece No.	Name of piece	Number required	Material	Material specifications	Drawing Nos. <sup>1</sup>	
					Contractor	Bureau
1	Body.....	1	Cast steel.....	4981, Cl. B.....		
2	Bonnet.....	1	Cast steel.....	4981, Cl. B; note 1.....		
3	Seat.....	1	Forged steel.....	4981a, CR81; note 2.....		
4	Disk.....	1	Nickel alloy.....			
5	Disk nut.....	1	Roller steel.....	4981a, CR81.....		
6	Stem.....	1	Bronze.....			
7	Nut for pc. 6.....	1	Bronze.....	4981a; note 3.....		
8	Gland.....	1	Forged steel.....	4982, Cl. An; note 4.....		
9	Yoke.....	1	Forged steel.....	4982, Cl. An; note 4.....		
10	Standard.....	2	Forged steel.....			
11	Nut for pc. 10.....	2	Forged steel.....			
12	Hand wheel.....	1	Aluminum alloy.....	49A1, Cl. 2.....		
13	Bonnet stud.....	2	Steel.....	43B11, Cl. B.....		
14	Nut for pc. 13.....	2	Steel.....	43B11, Cl. C.....		
15	Gland stud.....	2	Bronze.....	49B6; note 5.....		
16	Nut for pc. 15.....	2	Bronze.....	49B6; note 5.....		
17	Split pin for pc. 8.....	1	Brass.....			
3	SEAT.....	1	See above.....			

<sup>1</sup> These columns, shown in leaders, will only be required for finished drawings where reference to other drawings is necessary.

NOTE 1.—Die-cast carbon steel of following characteristics substituted:

Carbon.....	0.40 percent maximum.
Sulphur.....	0.045 percent maximum.
Phosphorus.....	0.04 percent maximum.
Tensile strength.....	70,000 pounds per square inch minimum.
Yield point.....	35,000 pounds per square inch minimum.
Longitudinal elongation in 2 inches.....	25 percent minimum.
Transverse elongation in 2 inches.....	30 percent minimum.
Longitudinal reduction of area.....	40 percent minimum.
Transverse reduction of area.....	35 percent minimum.

Cold bend, 180° to inner diameter of 1 inch.

NOTE 2.—Cast steel complying with chemical requirements of specifications substituted. No physical test, except minimum Brinell No. 200.

NOTE 3.—Surface inspection only.

NOTE 4.—In accordance with specifications, except minimum tensile strength 90,000 pounds per square inch and elongation 20 percent in 2 inches.

NOTE 5.—Tobin bronze substituted. No test.

Table I.

ALTERATION COLUMN TO BEGIN HERE FOR ALL PLANS		THIS SPACE TO BE KEPT CLEAR	
THIS COLUMN FOR OFFICIAL NUMBERS AND NAMES OF APPLICABLE VESSELS		THIS COLUMN FOR NAME OF BUILDING YARDS AND, IF DESIRED, HULL NUMBERS	
DD 412 U.S.S. HAMMAM DD 411 U.S.S. ANDERSON			
RESERVED FOR NAME ADDRESS AND PLAN NO OF OTHER SHIPBUILDING CONTRACTORS NAVY YARDS OR SUB-CONTRACTORS			
NAME, ADDRESS AND PLAN NUMBER OF SHIPBUILDING CONTRACTOR BY WHOM PLAN WAS DRAWN			
<b>CONTRACTORS PLAN NUMBER</b>			
SCALE _____		DRAWN BY _____ DATE _____	
TRACED BY _____		CHECKED BY _____ CHIEF DRAFTSMAN _____	
APPROVED _____			
FORWARDED TO BUREAU _____		APPROVED _____ DATE _____	
LETTER NUMBER _____		REFERENCE _____	
SUPERVISOR OF SHIPBUILDING _____		U.S.N.	
EXAMINED AND FOUND CORRECT _____ PLAN DATE _____ SUPERVISOR OF SHIPBUILDING _____ U.S.N.			
<b>TITLE</b>			
BUREAU OF SHIPS PLAN NUMBER _____			

**STANDARD TITLE BLOCK  
FOR CONTRACTORS PLANS**

SCALE 1/4" = 1' FOOT  
NAVY DEPARTMENT  
BUREAU OF SHIPS

WASHINGTON, D.C.

ALY 15

BU. OF SHIPS NO. 385691

*J. M. Jones*  
FOR CHIEF OF BUREAU